

Green Schools Create New Meaning of Sustainability

By Audrey Arthur

With changing building technologies and a changing climate, the benefits of green school design are becoming more and more obvious to architects and end users alike.

While being cost effective as well as socially and environmentally responsible, it has also become evident that green school design is a major benefit of student health and academic performance. The building industry and educators have taken note of the profits of green schools, and the demand is rising. According to McGraw-Hill Construction's study Green Outlook 2013, all new school construction is expected to be green by 2025.

With advanced technologies streamlining the sustainable building process and an increasing number of studies demonstrating advantages, creating a healthy, productive green school isn't as daunting as it may sound.

"Many of the principles of sustainable design and good school design go hand in hand, so it's a great partnership," said Amanda Voorhees, LEED AP BD+C, senior interior designer at Dewberry, headquartered in Fairfax, Va. "Daylighting, access to exterior views, clean air and a healthy building are just some examples of elements that are both successful in terms of sustainability and a good education environment."

Along with daylighting, outdoor views and improved indoor air quality, other green school trends include flexible spaces, demountable partitions, sustainable building materials, low-VOC materials and adhesives, integrated technology and green power, Voorhees said.

For schools that are interested in reducing their operating and maintenance costs, energy efficiency strategies have also become a major player in sustainable school design, said David Henebry, AIA, project manager at Dewberry.

"Energy efficiency is the primary interest from the financial side of the discussion," he said. "As budgets become more of an issue there is a strong focus on reducing energy-related operational costs. This also carries over into lifecycle costs related to maintenance of various products."

Evolving Technologies

Green building technologies are advancing in order to provide more insight to efficiency opportunities and trouble spots before decisions are made. Karina Ruiz, AIA, LEED AP BD+C, associate principal with Portland, Ore.-based Dull Olson Weekes-IBI Group Architects believes that new tools such as BIM technology that provides the ability to design in 3-D are driving innovation to bring green school design into the next generation.

"It's more about the evolution of the technologies than it is the evolution of the ideas," she said.

Designers can now more quickly see building values, quantify the impact of rearranging the building orientation and watch metrics play out in a BIM model, Ruiz said.

Voorhees named Revit software as being an instrumental tool in designing green schools. The software provides tools to support architectural design, MEP engineering, structural engineering and construction to produce high performing, energy-efficient buildings.

"Systems, building techniques and strategies can be studied on the computer and checked for conflicts. This

technique saves time, resources and money, all of which is more sustainable and results in a better end result," she said. "Also, being able to have immediate access to 3-D views helps with visualization and being able to make decisions upfront. The more decisions that can be fully understood and finalized while the building is still on the computer leads to savings in terms of overall project cost and project time. Precise planning upfront also results in minimal construction waste on the project site."

The use of new technologies can also help designers in predicting thermal performance and estimate utility costs of a building, Henebry said.

"Energy modeling is playing a large role in forecasting energy costs and system selection evaluation," he said. The building's thermal integrity can be balanced and matched to the systems selected for a more comprehensive solution. It also can identify cold or warm spots in the design under certain scenarios and allow design adjustments during design prior to construction.

A Deeper Understanding of Sustainability

One green trend that is currently taking strides in designing a building that will facilitate learning. Green schools provide an opportunity for the building itself to act as a teaching tool, and teachers can develop a new curriculum that revolves around the building's features, Voorhees said.

"A solar array providing energy to the building can include interior monitors that continually show the output of the equipment. These elements can be utilized as a year-long study tool and project for a science class learning about the conversion and transfer of energy and alternative energy sources," she said.

This growing interest in the educational value of green design is a benefit to students, teachers and the larger community, Ruiz said. The green education that students receive at their schools allows them to take those lessons and implement them into their daily routines. A building then accomplishes the triple bottom line of sustainability: environmental, economic and social sustainability. Using a green school as a teaching tool also equips upcoming generations with the knowledge they need to address the environmental issues of the future, Ruiz said.

"I think we're at a pretty critical point in the history of our earth. We can't continue to misuse it in the ways that we have in the past," she said. "Training a new generation of environmental stewards about respect for natural resources is incredibly important."

Ruiz served as project manager on the development of a school that focused on sustainable education. The LEED Gold Trillium Creek Primary School in West Linn, Ore., has garnered several design awards for its ability to be used as a tool for learning. The school, which opened in September 2012, received the 2013 Grand Prize for Exhibition of School Architecture from the National School Board Association and the Learning by Design Grand Prize Award 2013, and was named a 2013 Project of Distinction from the Council of Educational Facility Planners International.

"The reason that the building is successful is because it puts environmental stewardship on display," Ruiz said. "The kids, the parents, the teachers and the community can then gain a deeper understanding of what the sustainability initiatives are and we see kids begin to employ that in the rest of their



Daylighting and connections to the outdoors remain two big green school design trends.

lives in their homes."

Energy meters throughout the campus demonstrate the school's consumption of water, natural gas and electricity while also monitoring the amount of energy gained from the school photovoltaic panels and wind turbines. The LED meters are specifically placed at the front door of the school's learning neighborhoods in order for students to see them each day.

The design also demonstrates water conservation via runnels that connect from the roof to a horizontal channel in the school's concrete plaza and then unto the rainwater system.

"The approach that we took to green or to sustainability was all based around the educational value of sustainability. Even though we're able to demonstrate a significant amount of energy conservation or water conservation, we did that knowing that those efforts had educational value to them," Ruiz said.

Future of Green School Design

As for future trends in green school design, Ruiz believes that designers and educators should place more focus on building net-zero schools.

"That's going to take as much a different design as a different mentality by the users," Ruiz said. "There has to be an understanding that you are engaging with a building environment."

According to Lidia Berger, LEED Fellow with Dewberry, the value of sustainability is taking on new meaning. Whereas energy efficiency can often be expressed in dollars and cents, green schools are bringing about greater conversations of environmental and social benefits.

"Various environmental concerns and the overall effect of human activities on climate make it critical to focus our approach on metrics that go beyond simple economic impact evaluation and include environmental and social aspects of project decisions," she said. "Project outcomes such as productivity or well-being, reduced carbon dioxide emissions or improved resiliency are key to the decision-making process. These impacts often go beyond the project's boundaries, affecting external stakeholders and the environment alike."